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FOR

# JET BURNER OPTIMIZED IN EFFICIENCY

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## BACKGROUND OF THE INVENTION

The present invention relates to a jet burner in accordance with the preamble of patent claim 1 as well as a method for manufacturing the same, in accordance with the preamble of patent claims 10 and/or 12, respectively.

Jet burners for gas have been known since long. They mainly are used as radiators, grills or heaters. Usually these known jet burners punched ceramic plates or mats of weaved or pressed metal fibers as burner surfaces through which the gaseous fuels supplied through a burner pipe and a burner pot by means of a gas nozzle and a Venturi pipe to the burner surface, penetrate and are burned.

Moreover, for some time so-called „ceramic foam burners" have been known manufactured from spongelike, porous materials, ceramics in particular. For example, so-called „ceramic foam burners", i.e. corresponding jet burner surfaces, are manufactured in that spongelike materials, like e.g. foamed plastics of polyurethane, are soaked with liquid ceramic mass, wherein said soaked materials then are cured in a furnace, wherein simultaneously said spongelike material, i.e. the foamed plastic, burns up and porous spongelike ceramic structure remains. This very porous spongelike material shows an optimum permeability for the fuel gas and is perfectly suited as material for jet burner surfaces. The advantage of these materials on one hand lies in that burners with jet burner surfaces made from so-called ceramic foams have a large output per area, which is clearly superior to the above-described conventional materials, e.g. punched ceramic plates or metal fiber mats. In addition, this material provides

excellent burner-technological results with respect to their behavior in terms of exhaust gas technology, i.e. with respect to the output of disadvantageous carbon monoxides and nitrogen oxides (CO and NOx).

It is, however, a disadvantage in the known jet burners and jet burner surfaces in particular that the burner output related to the area cannot be regulated sufficiently, for a cooking place burner in particular. Particularly, in ceramic foams also a high burner output per area is given. This results in that jet burners with high burner output per area are hardly suitably for given intended uses, where in spite of a large surface of the burner a comparatively low output is required.

## SUMMARY OF THE INVENTION

It is, therefore, the object of the present invention to create a jet burner which with a certain given large surface shows a definite burner output, also comparatively low in particular. In addition it is to be manufactured in simple manner in particular, produce good results in terms of burner technology, exhaust gas technology in particular, and permit regulation in the desired range.

This object is solved by a jet burner showing the features of claim 1 as well as a method for manufacturing a jet burner, as defined in the features of claims 10 or 12. Preferred embodiments are subject of the depending claims.

The basic idea of the invention lies in that a generic jet burner is created which is not – like in prior art – formed with a uni-

form surface but with a heterogeneous burner surface. Therein, the burner surface of heterogeneous structure comprises at least two different surface areas, namely a first active surface area permeable for the fuel as well as a second active surface area impermeable for the fuel. In the permeable, preferably porous surface area the gas supplied to the jet burner can stream through said burner surface and can be burned up correspondingly. At the second inactive surface area, a preferably massive material, no gas can penetrate and burn subsequently. In this way it is possible the adjust the output related to the entire burner surface in desired manner by the selection of number or area region of the first active surface regions. By providing multiple, in particular uniformly distributed first active surface regions of, however, small size it in addition is also possible to guarantee a uniform distribution of the active regions in the burner surface so that uniform heating over the entire burner surface is possible.

Preferably, the burner surface of the jet burner is embodied such that a plurality of first active surface areas in form of nests is supported in a second inactive surface area. It e.g. proved to be advantageous here to choose ceramic foam as first active surface areas, whereas the second surface area is formed by a massive ceramic plate. Of course, it, however, also is possible to construct a jet burner in accordance with the present invention, using other materials for the burner surface, e.g. metal fiber mats or punched ceramics. In this case, it only is necessary to find a suitable material for the second inactive surface areas, wherein here all metals, in particular high-temperature steels or corresponding suitable alloys or also massive ceramic plates are available for selection. In this context it has to be noted that, of course, also in corresponding cases of use in which this is advantageous also a material mixture is conceivable, so

that e.g. the first active surface areas for example are formed of ceramic foam, whereas the second inactive surface area is formed of metal. Preferably, however, for connection technological reasons in particular materials of the same kind are used together, i.e. ceramic foams with massive ceramics or metal fiber mats with massive metal plates. Beside ceramic foams, of course, also metallic foams can be used, as long as they answer the demands to permeability with respect to gas and to thermal resistance.

The surface portion of the first active surface area preferably is adjusted in accordance with the desired output. A favorable value for thus use of jet burners for grill and cooking appliances, e.g. also in connection with glass ceramic cooking sites, lies in the range of 0.5 to 10 kW, 1 to 5 kW in particular, and most preferable 1 to 3 kW, with a total burner surface with a diameter of 50 to 300 mm, 80 to 200 mm in particular, preferably 120 mm in case of circular embodiment.

In order to guarantee a particularly uniform heating over the entire burner surface, the first and/or second surface areas can have different sizes and/or shapes and be distributed in the burner surface correspondingly. In particular uniform, raster-like or star-shaped arrangements with simple circular, strip-shaped, rod-shaped or curved (semi-circle etc.) offer themselves for this purpose.

A further advantage of the present invention, which also is subject of an independent claim category, is the simple manufacturability of the jet burner and/or a burner surface in accordance with the embodiment of the jet burner according to the invention, in particular. A jet burner in accordance with the present invention or a corresponding burner surface can be manufactured in simple manner in

that two suitable materials are selected which are connectable with one another in simple manner. With these materials independently from one another planar formations are manufactured (herein, it, however, also is conceivable that the formations have any desired shape, like semicircle, cylinder etc.), wherein from a first, in particular heat-resistant material after completion being permeable for the fuel, nests are cut out or manufactured in a shape and size complementary to openings worked out in the second material after completion being impermeable for the fuel, or which was manufactured with these openings correspondingly. If now the nests permeable for the fuel are put into said openings of the material impermeable for the fuel and solidly connected with one another, a burner surface in accordance with the present invention is manufactured in simple manner.

This is particularly true also for the preferred embodiment of the jet burner in which said burner surface is formed of a massive ceramic plate in which the nests of foam ceramics are inserted. This kind of jet burner namely combines the advantages that on one hand the best possible material in terms of burning technology, exhaust gas technology in particular, namely foam ceramics, is selected, wherein the per se high burner output per area of foam ceramics is reduced in that only corresponding nests of foam ceramics are arranged in a massive ceramic plate. The arrangement of the nests of foam ceramics in the massive ceramic plate can be effected in that either the completely prepared nests are glued into the completely prepared ceramic plate. Alternatively, it is, however, also possible to integrate the manufacturing process for the form ceramics into the manufacturing process for the finished burner surface, namely in that foamed plastics soaked with liquid ceramic mass, polyurethane in particular, is inserted into a ceramic mass or ceramic plate provided

with openings, this compound then being burned whereby said ceramic is cured and the foamed plastic is burned out so that in this area a porous ceramic foam is formed in a uniform ceramic surface.

A further simple possibility for manufacturing a jet burner in accordance with the present invention and/or a corresponding jet burner surface resides in that an originally completely permeable surface, e.g. a porous foam ceramics, is made impermeably partly, is sealed in particular. In case of a porous foam ceramics this might e.g. be done in that liquid ceramics is applied into the areas to be sealed and is burned subsequently.

Further advantages, characteristics and features of the present invention become evident from the following detailed description of embodiments with reference to the attached drawing.

## BRIEF DESCRIPTION OF DRAWINGS

The attached drawing therein in purely schematic manner in FIGs. 1 to 6 show different embodiments of a burner surface of a jet burner in top view.

## DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

FIG. 1 in top view shows a circular burner surface 1 formed out of a circular ceramic plate 2 into which the snake-like porous foam ceramics 3 is imbedded. Said porous foam ceramics 3 herein represents the area of said burner surface 1, acting as active burner portion in whose area also the gas fuel supplied through a burner pipe (not shown) and a burner pot by means of a gas nozzle (not

shown either) and Venturi pipe, penetrates through said burner surface and burns there.

Due to the snake-like embodiment of said foam ceramic 3 in total a large-area burner surface 1 is given, which, however, as compared to said burner surface 1 only has a restricted burner output.

The design of the form, the distribution and the portion of the active burner regions (first surface areas) in said burner surface can be constructed with high variability. It only has to be taken care that the portion is kept such that the desired burner output related to the basic surface of said burner surface is guaranteed and that uniform heating is given over the entire area of said burner surface 1.

Without being restrictive, FIGs. 2 to 5 show various possibilities of design of said burner surface with said active surface areas (first surface areas) 3 and said inactive surface areas (second surface area). Corresponding to FIGs. 2 to 6 said active surface areas 3 can be embodied in form of parallel strips, as wedges arranged in star shape, as circular dots, as semicircular arcs or a rods arranged perpendicularly to one another. They all have in common that they permit uniform distribution of said active surface areas 3 in said burner surface 1.

In spite of the fact that in the shown embodiments of FIGs. 1 to 6 said burner surface 1 always is formed as circular disk, it, of course, also is possible that said burner surface assumes any other suitable shape, e.g. rectangular, square, oval or the like.